Remarks/Arguments:

Applicant wishes to thank the Examiner for his detailed comments. As Examiner has chosen to group his comments by section, Applicant shall address each of these sections and points in turn.

1-2. No response is required.

Claim Rejections - 35 USC § 103:

3-4. Examiner has stated:

"Claims 1-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Freitag* et al. (USPub 2005,0122635) in view of *Li* et al. (USPN 6,909,583).

"Regarding claims 1, 10, and 19, *Freitag* et al. shows (Fig. 10), a disk drive comprising at least one hard disk, at least one magnetic head adapted to fly over the hard disk for writing data on the hard disk, and having an air bearing surface, the magnetic head including a read sensor including a free layer (202); a spacer layer (206); a plurality of self-pinned layers (220,222), but does not show interleaved layers of ferromagnetic metal and non-magnetic metal.

"*Li* et al shows interleaved layers (AP 1,15) of ferromagnetic metal and non-magnetic metal.

"It would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the self-pinned layers of *Freitag* et al. with the interleaved layers as taught by *Li* et al. The rationale is as follows: One of ordinary skill in the art at the time the invention was made would have been motivated to replace the self-pinned layers of *Freitag* et al with the interleaved layers as taught by *Li* et al to provide good pinning strength thus inhibiting amplitude flip."

5. "Regarding Claims 2 and 11, *Freitag* et al shows (Fig. 10), the magnetic head, wherein the plurality of self-pinned layers includes AP1 (220) and AP2 (222), where AP1 (220) includes an odd number of layers of ferromagnetic material (CoPtCr)."

6. "Regarding Claims 3, 12, and 20, *Freitag* et al shows (Fig. 10), the magnetic head, wherein the AP1 and the AP2 together have a net magnetic moment dM=0 (equal and opposite)."

7. "Regarding Claims 4, 13, and 21, *Freitag* et al shows (Fig. 10), the magnetic head, wherein the Dm=0 corresponds to a dT less than 5×10^{-10} meters, wherein magnetic thickness T=M xt, and M equals magnetization, t equals thickness of material, and dT is the differential in the layer thicknesses (inherent)."

8. "Regarding Claims 5, 14, and 22, *Freitag* et al shows (Fig. 11), the magnetic head, wherein the plurality of self-pinned layers has Hk > 200 Oe."

9. "Regarding Claims 6, 15, and 23, *Freitag* et al shows (Fig. 10), the magnetic head, wherein the plura*li*ty of self-pinned layers is pinned by magnetostrictive anistropy."

10. "Regarding Claims 7 and 16, *Freitag* et al shows (Fig. 10), the magnetic head, wherein the ferromagnetic metal of the plura*li*ty of self-pinned layers is chosen from a group consisting of CoFe, CoFe/NiFe, and Fe."

11. "Regarding Claims 8 and 17, *Freitag* et al shows (Fig. 10), the magnetic head, wherein the non-magnetic metal of the plura*li*ty of self-pinned layers is chosen from a group consisting of Ru, Cr, Ir, Cu, Rh, and Re."

12. "Regarding Claims 9 and 18, *Freitag* et al shows [0042], the magnetic head, wherein the read sensor is of Current Perpendicular to the Plane (CPP) configuration."

The Examiner has merely reiterated his rejections from the previous Office Action and reserved his arguments for the Response to Arguments section, below, and so Applicant will address these arguments in the section below as well.

Response to Arguments

Examiner has stated:

13. "App*li*cant's arguments filed June 29, 2006 have been fully considered but they are not persuasive.

"The App*li*cant states on page 7, *li*ne 27 that *Li* does not teach self pinned layers.

"The Examiner maintains that the 103(a) combination re*li*es on *Li* for "interleaved layers (AP 1,15) of ferromagnetic metal and non-magnetic metal", and not self pinned layers. Frietag provides the self-pinning properties. The App*li*cant admits on page 7, *li*ne 18 that *Li*'s invention maintains "good pinning properties". Thus in combining *Li* with Frietag, Frietag's pinning properties would be maintained while adding the advantage of for "interleaved layers (AP 1,15) of ferromagnetic metal and non-magnetic metal" to improve performance of *Freitag*'s sensor. Therefore, the rejection of Claims 1-23 are upheld."

Thus Examiner's argument apparently is that *Freitag* shows a self-pinned structure that does not have interleaved ferromagnetic metal and non-magnetic metal layers, and thus relies on a different structure and mechanism for self-pinning then that of the present invention. Then, Examiner adds a disclosure of interleaved ferromagnetic metal and non-magnetic metal layers from *Li*, however using different materials than those used by the present invention, and whose structure is not directed at self-pinning at all, and which would in fact not function

for this purpose. The Examiner then claims to come up with combination from these two references which makes the present invention obvious.

In order to take components from these two references and combine them to make a structure resembling that of the present invention, one would have make modifications which are not taught in any of the cited references. It would require one to take the interleaved structure of *Li*, which uses completely different materials (FeTaO), change the composition of the non-magnetic metal layers to one of the group consisting of Ru, Cr, Ir, Cu, Rh, and Re (not taught in *Li*), and inset it into the structure of *Freitag*. Doing this does not just modify the basic self-pinned structure from *Freitag*, it replaces it with another structure altogether, and the structure it replaces it with is not contemplated or even mentioned in *Li*. This is impermissible hindsight, and an unfair basis for an obviousness rejection.

In addition, there can be no motivation for undergoing such elaborate modifications merely to combine references. Applicant again emphasizes that *Li* does not teach self-pinning, as is evident by the presence of AFM material. It is precisely this AFM material which self-pinned structures strive to eliminate. The present inventor informs me that FeTaO material is completely unsuitably for use in self-pinning structures, and on the contrary, the presence of FeTaO would be known by those skilled in the art to **degrade** pinning of the layers. The goal in *Li* is to increase the DR/R ratio, thus improving the sensitivity of the sensor, but is not concerned with producing self-pinned layers. In *Li*, the specularly reflecting nano-oxide layer of FeTaO (19) is used to produce specular reflection of the electrons, which is related to the DR/R performance of the sensor, and has nothing to do with pinning the layer. Thus the emphasis by *Li* is on "maintaining good pinning properties", meaning that *Li* has found a way to prevent the FeTaO material from impairing the pinning effect of the AFM layer on the pinned layer. It does not enhance self-pinning, and has no intentions to do so. There can be no motivation to replace a self-pinned structure with a non-pinned structure, as the result would not function as a read head.

As further demonstration of the difference in structures, Claim 1 as amended now recites:

> "A magnetic head comprising:
> a read sensor including:
> a free layer;
> a spacer layer;
> a plura*li*ty of self-pinned layers, said self-pinned layers including interleaved layers of ferromagnetic material and non-magnetic metal wherein said non-magnetic metal of said plura*li*ty of self-pinned layers is chosen from a group consisting of Ru, Cr, Ir, Cu, Rh, and Re."

The *Li* reference recites that it includes:

"A novel, specularly reflecting nano-oxide layer within its pinned layer" (col. 3, *lines* 63-64).

Also, *Li* includes:

"An MnPt antiferromagnetic pinning layer (4)" (col. 4, *lines* 42-43),

and that

"The API layer...comprising a layer of CoFe (17) ...a specularly reflecting FeTaO layer (19).. on which is formed a layer of CoFe (21)" (col. 4, *lines* 52-60).

Thus it is apparent that the *Li* discloses a different structure for a different purpose, and has no relevance to the present structure in which an interleaved structure having non-magnetic metal chosen from a group consisting of Ru, Cr, Ir, Cu, Rh, and Re in order to produce self-pinning.

Therefore, it cannot be fairly said that the present invention is made obvious by the cited references, either alone or in combination.

Thus, Applicant further respectfully asserts that the present invention is not obvious in view of the cited references. Applicant respectfully requests that the rejection be withdrawn and Claim 1 be allowed.

Claims 1, 10 and 19, as amended all include this feature of an interleaved structure having non-magnetic metal chosen from a group consisting of Ru, Cr, Ir, Cu, Rh, and Re in order to produce self-pinning. Applicant therefore respectfully asserts these claims are all allowable over the cited prior art. Applicant respectfully requests that the rejection be withdrawn and Claim 1 be allowed.

Claims 2-7 and 9, Claims 11-16 and 18, and Claims 20-23 are dependent on Claims 1, 10 and 19 respectively and all include by their dependence the assertedly non-obvious feature of an interleaved structure having non-magnetic metal chosen from a group consisting of Ru, Cr, Ir, Cu, Rh, and Re in order to produce self-pinning of the claims as amended. Therefore, Applicant respectfully asserts that these claims are also not made obvious by the cited references, either alone or in combination. Applicant therefore respectfully requests that the rejection be withdrawn and Claims 2-7 and 9, Claims 11-16 and 18, and Claims 20-23 be allowed.

In reference to the rejection of original Claims 8 and 17, whose *li*mitations are now found in Claims 1, 10 and 19, Examiner claims that *Freitag* shows a magnetic head, wherein the non-magnetic metal of the plura*li*ty of self-pinned layers is chosen from a group consisting of Ru, Cr, Ir, Cu, Rh, and Re. However, *Freitag* only shows a single layer of Ru, and it is not used in an interleaving structure such as in the present invention.

For the record, Examiner has apparently overlooked or not fully considered the arguments from Applicant's Response filed June 29, 2006 that "In addition, Applicant can find no support for the statement that in *Freitag* "the AP1 and the AP2 together have a net magnetic moment dM=0 (equal and opposite)," ..." Examiner has made no comment on this or shown where this feature can be found in the cited reference, other than referring to Fig. 10. In a similar manner, Examiner has a apparently not considered the substance of Claims regarding Claims 4, 13, and 21, wherein the Dm=0 corresponds to a dT less than 5×10^{-10} meters, wherein magnetic thickness T=M xt, and M equals magnetization, t equals thickness of material, and dT is the differential in the layer thicknesses, or Claims 5, 14, and 22, wherein the plurality of self-pinned layers has Hk > 200 Oe. There is a chart below [0038] which shows a coercivity of 60 Oe, but this is far short of the value of 200 Oe required. Examiner merely makes reference to Fig. 10 of *Freitag* which does not address any of these limitations. These properties are not such that they may be found in a drawing figure.

However, Applicant respectfully asserts that these points in regards to the dependent claims are moot in view of the patentable features of the independent claims 1, 10 and 19, as pointed out above, and may be disregarded if the Claims are allowed. Otherwise Applicant would appreciate specific citations where these limitations may be found in the prior art.

Thus, Applicant respectfully asserts that Examiner's statement above that

> "Thus in combining *Li* with Frietag, Frietag's pinning properties would be maintained while adding the advantage of for "interleaved layers (AP 1,15) of ferromagnetic metal and non-magnetic metal" to improve performance of *Freitag*'s sensor..."

does not make sense. *Li* does <u>not</u> teach an advantage of interleaved layers of ferromagnetic and non-magnetic material for <u>self-pinning</u>. If the interleaved layers including FeTaO as taught in *Li* were to be added to the structure of *Freitag*, the pinning strength would be <u>degraded</u>, if not totally disabling, and certainly not improved. This is well-known to those skilled in the art. Pinning in *Li* is only maintained at all because of the inclusion of an AFM layer. The removal of an AFM layer in the read head is exactly the motivation for creating self-pinned layers

in the first place, and is a disincentive for combining *Li* with *Freitag*. Thus, *Li* does not disclose an advantage for strength of self-pinned layers, but instead it teaches away from this.

Before the present invention can be said to be obvious in view of a combination references, there should at least be some teaching of an interleaved layer structure which does not degrade the self-pinning performance of such a structure. Otherwise it cannot be fairly said to provide an obvious combination.

Therefore, it cannot be fairly said that the present invention is made obvious by the cited references, either alone or in combination.

Thus, Applicant further respectfully asserts that the present invention is not obvious in view of the cited references. Applicant respectfully requests that the rejection be withdrawn and all claims present in the case be allowed.

Conclusion:

Applicant has endeavored to put this case into complete condition for allowance. It is thought that the current amendment has overcome the claim objections, and that §103 rejections were unfounded on the references cited. Applicant therefore respectfully asks that the objection and rejections be withdrawn and that allowance of all claims presently in the case now be granted.

If the Examiner would like to discuss any of the points involved in the Response, he is urged to contact Applicant's Attorney at the numbers included below.

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